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ROCKS AND MINERALS

Magazine For Mineralogist, Geologist & Collector

OFFICIAL JOURNAL OF

THE ROCKS AND MINERALS ASSOCIATION

UBLISHED MONTHLY SEPTEMBER, 1934

THE BULLETIN BOARD

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Editor's Note—By covers is meant ordinary envelopes.

ARE YOU IN FAVOR OF AN OFFICIAL PIN?

A number of members of the Rocks and Minerals Association have expressed a wish for an official pin that could be had at a fair price. We are in favor of the idea as the advantages of such a pin need hardly be pointed out. By wearing pins, members of the Association can recognize fellow members when traveling and especially when out on field trips. A pin will oftentimes gain admission to a quarry or mine that otherwise might be closed to the general public.

ROCKS and MINERALS would appreciate comments from its subscribers and members on an official pin. If enough members show an interest, we will endeavor to have such a pin made up. We would also welcome drawings or designs of pins from which a selection could be made. To be considered, a drawing or design must typify the Association and its official specimens, Granite and Gold. For the best drawing or design submitted, in the judgment of the Editor, a choice specimen of iridescent obsidian from Stauffer, Oregon, will be given as a prize.

Mineralogical Society of Springfield Vt.

Feeling that those of similar interests should be acquainted, ten zealous mineralogists of Springfield, Vermont, met last April with the intentions of forming a club. No definite action was taken then and it was decided to leave the charter open until the next meeting, June 6, when the club was organized with seventeen charter members. Since that time two new members have joined, bringing the total up to nineteen, with three of the members out of town.

Meetings are held the first Wednesday of every month and field trips are arranged for the summer months, usually about the second Saturday.

Mr. H. L. Chandler is president of the club, with Mr. Roy Lyons as vice-president, Mr. E. N. Brookings, treasurer, and Mr. Edward Allison, secretary.

The club is open to all collectors with membership fee of one dollar a year. Mineral exchanges are also desired, the secretary being in charge of this. For further information address the secretary, Mr. Edward Allison, 9 Litchfield Street, Springfield, Vt.

ROCKS and MINERALS

A MAGAZINE FOR MINERALOGIST, GEOLOGIST AND COLLECTOR

PUBLISHED MONTHLY --- FOUNDED 1926

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The Official Journal of the Rocks and Minerals Association

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To assist its subscribers with their mineralogical problems and especially those who are beginners, ROCKS and MINERALS will gladly identify specimens and without charge if the following rules will be observed:

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3. Enclose a self-addressed stamped envelope with your letter.
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ROCKS and MINERALS

Edited and Published by Peter Zodac

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The Official Journal *of the* Rocks and Minerals Association

SEPTEMBER, 1934

VOL. 9, No. 9

WHOLE No. 39

Topaz and Herderite at Topsham, Maine

By BENJAMIN B. BURBANK

There exists a long, low ridge running northeast and southwest entirely across the town of Topsham, Maine. This ridge is cut by a great many pegmatite dykes and consequently is spotted with dozens of feldspar quarries or prospect holes; some of them are active but for the most part they have been long abandoned. Collecting along this ridge; even on its extensions over into Brunswick on the south and Bowdoinham on the north, has been always interesting and profitable. However the region of chief interest lies wholly within the town of Topsham. The territory has been surveyed by the U. S. Geological Survey but the topographical sheet[1] does not indicate the various quarries. The sketch (Fig. 1) with reference numbers placed at the points of chief interest, will better enable the reader to visualize the region.

The most highly mineralized zone of the entire region is the Fisher Feldspar Quarry[2] which consists of a deep cut running nearly north and south along the southern slope of the first hill north of the Cathance River. The quarry has been long abandoned and is surrounded by large weathered dumps. The occurrence here of large quantities of cleavelandite and lepidolite had not been reported in this section prior to the writer's discovery in 1929. It was thought that the gem bearing pegmatites characterized by those minerals were common only to the regions about Mt. Apatite, Mt. Mica and the northern part of Oxford County in Maine.

Apparently here in this quarry years ago they blasted through considerable platy cleavelandite and flaky lepidolite sufficient to arouse the interest of any collector. They also blew open several pockets containing very beautiful pocket beryl which was saved by the workmen as curios or given the children to play with, all without written record or scientific notice.. The leasee of the property when shown some excellent herderite crystals said: "Yes, I have seen many of them while quarrying."

Many years elapsed between the time of active operation and the first visits of the writer to the Fisher Quarry and, consequently, much weathering had disguised or hidden the cleavelandite and lepidolite. This, undoubtedly, explains in some measure why mineral collectors had never before found the pocket with its topaz and herderite. The finding of excellent cleavelandite crystals in small vugs at some distance from the actual topaz pocket focused the writer's attention on this quarry. After several visits a large book of greenish muscovite near the old quarry floor at the foot of a column of unquarried

[1] U. S. Geol. Survey. Bath, Maine Sheet (topographical).

[2] Bastin, E. S., Geology of the Pegmatites of Maine, Bul. 445 U. S. Geol. Survey 112, 1911.

graphic granite attracted attention. On removal of the muscovite it was found to be bordered with lilac lepidolite and had quartz crystals attached to the back side. The muscovite proved to be the door to a cavity sufficiently large to permit reaching a hand into a larger pocket beyond. Quartz crystal faces and terminations were visible within, which furnished the incentive to break into the pocket itself. It proved to be about one cubic foot in capacity. The roof was lined with smoky quartz crystals attached to cleavelandite. Upon the face of one of the quartz crystals was a small honey-yellow crystal since identified as herderite but unknown to the writer at that time. The bulk of the pocket was filled with loose material containing etched fragments of beryl, rose, greenish and colorless; quartz crystals, lepidolite shell containing small blue tourmalines, and a sticky white kaolin. After carefully washing some of the material taken quite far down in the pocket, colorless and bluish green topaz fragments appeared, etched fragments of former crystals. The amount of the topaz taken when the pocket was first opened amounted to approximately 200 grams some pieces being of excellent quality. This first collecting thus yielded an abundance of mineral specimens before found in Maine only in Oxford County.[3]

Little was done at the quarry from 1929 to the fall of 1932 owing to the writer's absence. In the fall of 1932 prospecting was again resumed and the pocket revealed itself as one extending downward indefinitely. More and larger fragments of topaz with many crystal fragments on matrix were found but no herderite. Owing to the presence of water (the pocket was on the floor of an old section of the quarry) there was a limit to the amount of development work that could be done.

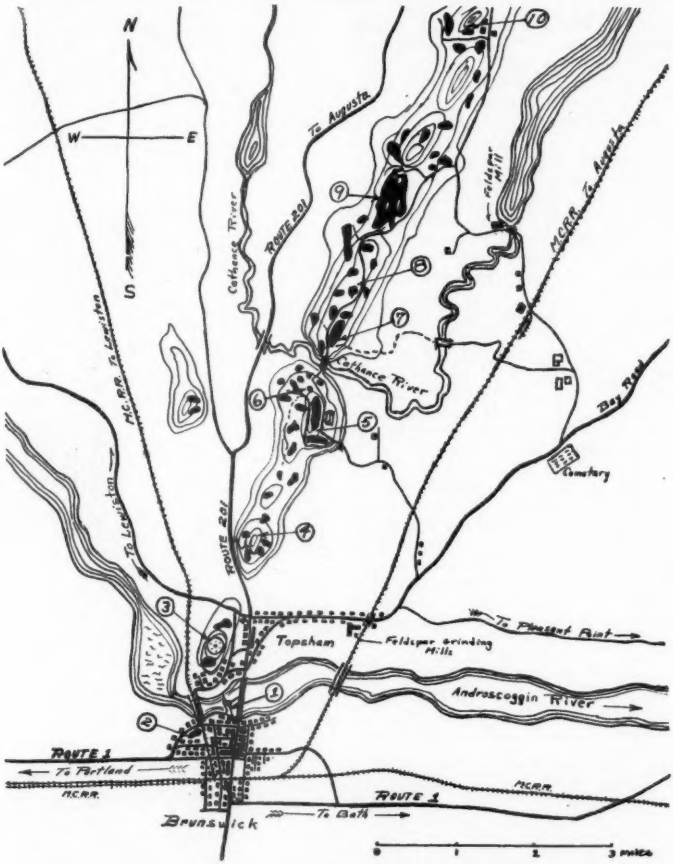
During the winter of 1932-33 a study of the specimens was made and the desire to be positive of identifications caused the writer to mail several specimens to Dr. Charles Palache of Harvard University. The rare occurence of topaz in the New England Pegmatites coupled with its occurrence in a region hitherto thought outside the gem producing region aroused great interest on the part of Dr. Palache. Late in May the writer with Mr. Leonard H. Starbird, President of the Maine Mineralogical and Geological Society, as his guest, visited the locality and did extensive development work exposing magnificent crystals of what was then thought to be topaz of a slightly different form along with many excellent fragments of topaz similar to that previously found. Before sufficient time elapsed to give the specimens proper study and identification Dr. Palache visited the writer to see his specimens found and particularly to see the locality. He quickly identified the most perfect crystals as herderite of perfect orthorombic symmetry, resembling closely the topaz habit as found at this locality. Thus our enthusiasm turned to herderite and so even though a downpour of rain continued all day four of us, Dr. Charles Palache, Mr. Forest A. Gonyer, Mr. Leonard H. Starbird and the writer visited the locality. An abundance of herderites and topaz specimens were collected without anyone being really conscious of the downpour. Several minerals in minor quantities were found such as gahnite, columbite, cassiterite and others.

The herderites occurred for the most part in the downward extension of the pocket, some attached to the cleavelandite and lepidolite or muscovite; some thus attached were surrounded with glistening terraced crystals of sericite which seemed to coat everything except the herderites and quartz in this part of the pocket. To one side of this zone of herderites occurred a very thickly interlaced seam of blue tourmaline, small clear crystals of the variety indicolite, beyond this a plentiful spattering of topaz crystals in lepidolite-cleavelandite matrix. No topaz was found that was entirely free from etching. A few crystals occurred complete enough to show the crystal habit clearly even though etched.

To everyone it was evident that the pocket extended downward and would undoubtedly yield more specimens, all hoping that more and larger herderites would be found. A working per-

[3] Kunz, G. F., Topaz & Associated Minerals at Stoneham, Maine. American Journal of Science, 27, 212, 1884.

Bastin, E. S., Geology of The Pegmatites of Maine, U. S. Geol. Survey, Bul. 445, 100-101, 1911.



Map of Mineralized Areas in Topsham, Maine

1. Molybdenite occurs at Brunswick in the ledges at the upper falls of the Androscoggin River and under the foundations of the Cabot Manufacturing Co. Both are inaccessible at present.

2. Aquamarine beryls occur in a road metal quarry on Mill Street, Brunswick, near the Lewiston Branch of the Maine Central R. R.

3. On Standpipe Hill in Topsham, excellent magnetite crystals and a few columbite crystals have been found.

4. At Mt. Ararat in Topsham, large books of muscovite, biotite and a few beryls have been found.

5. At the quarries of the Consolidated Feldspar Company occur: beryls, some of gem quality (aquamarine), large wedge and spear-head type books of muscovite, abundant quartz and magnetite, some columbite and garnets, and molybdenite is found in small quantities.

6. Near the crest of the first hill south of the Cathance River, beryls are quite numerous, small vugs contain quartz crystals and considerable samarskite has been recently found there.

7. The locality of the Topaz and Herderite Pocket which is to be the subject of this article.

8. Columbite, in lumps weighing several pounds has been found at a long abandoned quarry which is conspicuous because of a large pile of snow white soda feldspar.

9. The oldest quarry in the region known as the "Trenton Flint and Spar Quarry, or locally the "Big Ledge" is the locality of much mica and parallel growth quartz.

10. In the town of Bowdoinham some rose quartz and numerous Beryls have been found.

mit from Mr. W. D. Willes, the leasee, was obtained by Dr. Palache and late in June work was begun in the interest of the Harvard Mineralogical museum under the direction of Mr. Gonyer, with the writer assisting. Much development work was done to follow the downward extension of the first pocket opened in 1929. Sounding with poles gave indications that the pocket extended at least six feet downward. The development work was carefully planned by Mr. Gonyer and consisted of sinking a pit in a semi-circle of about ten feet radius around the pocket extension, downward some six to eight feet without breaking into the pocket itself. During the early development work no one knew that such a pocket as was found could exist below and consequently some uncanny things happened toward the last. Dynamite shots would fail completely to move rock at the point of blasting but would gush mud and water violently up some nearby old drill hole or out through the pocket extension. One time the air drill dropped down suddenly and air came bubbling up through the pocket extension some ten feet away. After a few of these happenings it became certain that there was a large pocket below and Dr. Palache arrived to be present at and to stay through the opening and removal of the contents of the pocket.

In quarrying downward a few herderites were encountered. One large specimen of cleavelandite taken during the preliminary work weighed about two hundred pounds and had near its center a topaz crystal well set into it and on the topaz a few small herderite crystals. This specimen had almost every mineral that was found at the locality represented upon it. Dark green gahnite occurred in badly shattered crystals in the cleavelandite removed during the preliminary work, also much muscovite was found.

View of pocket showing Mr. Gonyer within. About one-third of contents removed.

Small charges of dynamite well placed in shallow holes succeeded in opening a small hole yet large enough to work through into the upper corner of the large pocket. After removing the pieces of rock tumbled in by the blasting and after bailing out considerable mud, the pocket was exposed partially to view a place no man had ever looked into before. By placing a plank in on the mud one could crawl in, assuming a prone position and reach down into the sticky mud to search for specimens or to examine the large smoky quartz crystals lining the roof. The work of removing the contents of the pocket took on a very orderly aspect. No tools were used within; all the material was removed with bare hands or with gloved hands for protection against cuts, and placed in pails or boxes and taken to washing screens at a nearby water hole, where it was washed carefully to remove all clay and silt, then taken to sorting tables and inspected by someone capable of recognizing anything of interest. This work was supervised by Dr. Palache, with the very active and helpful co-operation of Mrs. Gonyer and Mrs. Burbank who did much of the sorting of the pocket material. Mr. Gonyer or the writer did most of the work in the pocket. As the work of removal progressed the pocket assumed proportions more comfortable to work in and eventually proved to be about eight by six by four feet. Water came in rather slowly and bailing was necessary only two or three times a day but did not prevent work at any time. The lack of excessive water in the pocket could not be laid to good luck entirely because it had been necessary before reaching the pocket to drain a nearby quarry hole to a level some ten feet below the point where development work commenced. The drainage was accomplished by installing about two hundred feet of two inch pipe for a syphon line.

The pocket as opened consisted of a cavity in graphic granite lined with

platy cleavelandite along the side walls and roof, the plates perpendicular to the wall. This lining ranged from two to eighteen inches thick. The thickest contained small vugs. The roof just over the point of entrance was composed of a beautiful flesh colored feldspar, etched on its surface and altered to albite which had crystallized in glistening white crystals over part of the exposed area. Back of the feldspar and over the major portion of the roof was cleavelandite as before described but studded with large and small smoky quartz crystals jutting into the pocket, some had undoubtedly fallen into the pocket ages ago. Feldspar fragments that had fallen into the pocket had suffered almost complete etching and replacement by lepidolite or sericite shell formations. Lepidolite and sericite shells were well penetrated by blue tourmaline crystals of knitting needle size. Clear and perfectly terminated crystals were very common. Filling all the space between the larger fragments and crystals was kaolin, a very white pasty clay which was filled with thousands of tiny loose tourmaline crystals some two or three inches long and up to an eighth of an inch in diameter. A few topaz fragments were found in this clay but the largest pieces were found in crevices in the cleavelandite at the very bottom of the pocket, as was some very much etched beryl. A very few herderite crystals were found loose or attached to muscovite and cleavelandite in this large pocket but were very inferior to those found six feet above in the first pocket.

Topaz:

The topaz had at one time been very well crystallized in doubly termiated prisms but etching had reduced them to mere skeletons of their former selves and no doubt had taken them completely away in many cases. Those we found are the remains of crystals severely etched to a mass of points and pits but bearing resemblance in all cases to the original crystal faces and angles. The color was either clear colorless or bluish green (aquamarine). Some of the larger varied from colorless to blue-green in one and the same piece. Cleavage was sharply in evidence by internal flaws if not by actual cleavage faces. The largest piece of topaz weighed just under three pounds and in all thirty pounds were taken from the pocket. The fantastic etching is evident from the photos. The edges of these etched pieces are razor sharp and were dreaded when reaching blindly down into the mud in the pocket.

Herderite:

The herderites were of the orthorombic crystalline habit and all that were found were alike in this respect.

Group of the five largest crystals of topaz. Upper right crystal weighs just under three pounds.

The major angles of the herderite crystals are so nearly identical to those of the topaz as found at this locality that they were easily confused in this respect. The crystals varied from micro-mounts to the two large crossed crystals shown in the photo, which are two inches maximum length. The crystals of herderite are all internally fractured, semi-opaque and white or honey colored with a very high gloss surface. They were the last to crystallize as they were found perched on cleavelandite, quartz, muscovite, lepidolite and topaz, and in no case covered with the late coating of sericite that covered nearly everything else in the pocket. Slightly above and to one side of the richest herderite zone lay the remnants of a gigantic beryl crystal that had suffered severe etching. It is probable that this beryl furnished the beryllium for the herderites which are a beryllium fluo-phosphate, thus the herderite crystallized on the outskirts of the region of intense etching of the large beryl and were thus somewhat localized. The number of herderite crystals taken large and small would run into several hundred. Many matrix specimens had from one to twenty crystals on a single piece. The crystal habit is being carefully studied and measured by Dr. Palache and will be completely described and recorded soon.

Quartz:

Some very peculiar quartz crystals were found loose in the pocket being distorted to little resemble the usual crystalline habit of quartz. Flattened crystals were very common, flattened parallel to two faces but not by pressure of some surrounding substance, they had apparently no point of attachment in many cases.

Beryl:

The beryl found was of a faint pink color showing much gas inclusion in the form of tiny bubbles giving it a milky appearance in places. One piece showed the terminal faces with hardly any etching yet was badly etched all over elsewhere. The bulk of it was deeply etched however and it totalled about five or six pounds. A few fragments of aquamarine were found but weighed only a few grams each.

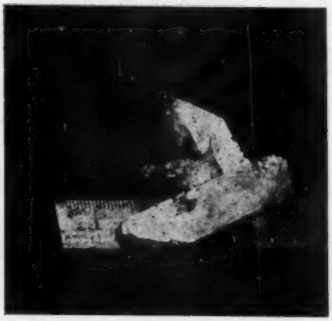
Torbernite:

Torbernite was found sparingly in beautiful apple green plates filling seams and fractures in a blackish cleavelandite muscovite matrix. Specimens from this locality glow beautifully under the argon bulb.

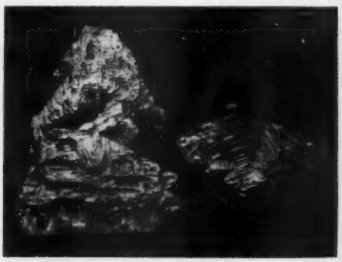
Other Minerals:

A single crystal of apatite, opaque and roughly hexagonal was found. Cassiterite very sparingly in cleavelandite. Columbite occurred in blade crystals, black with an intense blue iridescence, being well imbedded in cleavelandite. One small crystal of stibio-tantalate was found by Mr. Leonard Starbird after operations ceased, this was found on the fresh dumps.

For further details the reader is referred to the article by Dr. Charles Palache which appeared in the Janu-



Largest herderites with centimeter Scale



Topaz crystals showing etching and pattern development

ary, 1934 issue Vol. XXVII of the American Journal of Science, entitled "A Topaz Deposit in Topsham, Maine." This article gave a very fine paragraph on the probable origin of the pocket. It is at the suggestion of Dr. Palache that the writer has prepared this article.

Scolithus Remains in the Cambrian Quartzites of Southern Pennsylvania

By PRESTON E. CLOUD

An interesting slab of Mont Alto quartzite of Lower Cambrian age, containing numerous Scolithus borings, was recently found in Quincy Township, Franklin County, Pennsylvania, and placed on exhibition in the department of geology of the U. S. National Museum. This slab, which is 44 centimeters square and 25 centimeters thick, is pierced by numerous linear worm tubes, 30 or more centimeters long and a fourth of a centimeter in diameter, penetrating the quartzite at right angles to the bedding planes which show quite distinctly, being represented by alternating dark and light layers.

The name **Scolithus,** derived from the words scolex (worm) and lithos (stone), and the specific name **linearis**, from the linear arrangement of the tubes, well describes this species. **Scolithus linearis** is a characteristic fossil of the Lower Cambrian quartzites throughout the Blue Ridge mountains. The tubes forming this fossil are generally suposed to have been made by a wormlike animal buried in the sands of Cambrian time with only its head appearing above the surface. Upon the death of the animal, the hole or burrow remaining after its decomposition was filled with sand, which, with the surrounding sandy material, was, in the course of time, cemented together to form sandstone. This sandstone was in its turn changed by heat and pressure, or metamorphosed, into quartzite. Some paleontologists believe, because of its resemblance to the tubes of certain bryozoa of today, that Scolithus represents the tube or burrow, not of a worm, but of a very primitive type of bryozoan. If Scolithus proves to be a bryozoan, it represents the oldest member of this group as the earliest undoubted species is one found in the Upper Cambrian rocks of Esthonia.

Scolithus linearis is of additional interest from the fact that boulders containing it are found in conglomerates and gravels of various younger ages along the Atlantic Coast Plain. Since the uplift of the Appalachian mountains in Paleozoic times, the Lower Cambrian quartzites, on account of their hardness and insolubility, have stood up as ridges for many ages, and, through weathering, have furnished boulders for formations of more recent times. The Scolithus remains in the boulders determine the original age and origin of the rock and give a clue to its history. Such boulders are not uncommon in the Potomac formation, of early Cretaceous age, of the eastern states. Again, they occur frequently in the Pliocene gravels widespread over the Atlantic Coast Plain, and also in the various terrace formations of Pleistocene age along the Potomac and other rivers of the east. These worm riddled rocks, therefore, have a long story behind them. Romance and worms are seldom linked, but what could be more romantic than the immortality of this Cambrian worm which, as one of the earliest ancestors of present life, has left his monument in the various ages of the past.

The Emerald, Prince of Adventure

By A. D. BLALOCK

The glorious green of an emerald—to the primitive, the personification of life and growing things; to man today among the rarest and most treasured of gems. The diamond is still the most important gem in the amount of money invested because there are more of them. The beautiful pigeon blood rubies of Burma and Ceylon have contributed their share in the rich lore and wealth of the far East. But no gem on earth is more synonymous with romantic adventure than the emerald if we but glance through a few pages of fairly recent history. And both the richest history and the finest stones originated on our side of the globe.

Emeralds, to be sure, have been known and used as gems for a long, long time. The large green stone mentioned in the Bible as composing one of the stones in Aaron's breast plate is thought to have been an emerald. Tradition has it that the lens which Nero carried about with him to enhance a dimming eyesight was carved from a particularly flawless emerald. History mentions green stones thought to have been emeralds decorating ancient Egyptian temples. We have ancient writings dealing with the healing and magic qualities of precious stones among which the emerald figures permanently. Pliny some 1800 years ago suspected the connection of emerald with beryl and at the same time recommends it as a cure for dysentry, a prophylactic against epilepsy, and as an assistance in childbirth. It was regarded also as a guardian of chastity and in the case of trespass would break of its own accord into many small fragments.

At the time of Alexander the Great, miners from Greece were taking emeralds from the mica schists a little south of Eofu on the Nile. These mines were situated on the slopes of a mountain range running parallel to the Red Sea. From this source undoubtedly came the beautiful stones that adorned the persons of the mighty pharoahs. Later they became known as Cleopatra's mines. From here probably came the stones which were fashioned into beautiful jewels and used by her to dazzle the eyes of Mark Antony. These diggings were consistently worked, producing many fine stones but eventually they played out, were abandoned and lost. Near the beginning of the present century they were rediscovered and the small catacomb-like burrows explored.

On this side of the world, emeralds were discovered among the Aborigines soon after Columbus' voyage. When Cortez burned his ships and set out into the present land of Mexico he was surprised at the high state of civilization among the Aztec Indians found there. But he was more astounded at finding quantities of large and beautiful emeralds in their possession. The Aztecs, like most North American Indians, were nature worshippers. Emeralds were used along with several other gems in their various religious ceremonies. High value was placed on **chalchihuitl,** meaning "green stone," which jointly incorporated green turquoise and a form of green jade. These green stones together with the emerald were invested with a religious significance. The emerald representing the green of growing things embodied the spirit of verdure. Likewise the principal god, the sun, was personified in the glistening sheen of gold. Blue and green turquoise represented the spirits of sky and water respectively. The temples of these Indians were filled with beautiful statues and ornaments of pure gold and many of them were set with emeralds of magnificent proportions.

Greed seized the Spaniards at the sight of such treasures. Despite many rich gifts from the hospitable natives, the temples were soon desecrated. Sacred images were looted of their precious stones and the gold hammered down into bars of bullion. Unsatisfied with what they already had, they resorted to torture in an effort to wring from the Indians the source of the gold and emeralds. In this they were unsuccessful. They did secure infor-

mation as to the source of the turquoise where it was found some hundreds of miles north in what is now New Mexico. The only knowledge that they obtained with reference to the emeralds was that they came from a land far to the south, many moons away. No deposits of fine emeralds like these have been located anywhere in the south-east and it is generally conceded that their origin was the now famous mines of South America. The stones were probably obtained by the Aztecs by means of barter and war with tribes to the south.

The booty captured by Cortez and sent back to Spain undoubtedly contributed its part in the following expeditions characterized by the same lust and cruelty. Ten years later history repeated itself in the sanguinary exploits of Pizarro in Peru. Here he and his men found a civilization among the Incas equal to if not surpassing that of the Aztecs. Here too, were emeralds of exquisite size and beauty. Once again were blackened the pages of the white man's history. More cruelty and torture; more temples looted and stripped and even the houses were ransacked of everything of value. On top of this the friendly chief of the confederated tribes was seized and held for ransom, the amount of which was to be determined by the quantity of gold and gems necessary to fill a designated room some eight or ten feet square to a height variously estimated at six to eight feet. To this the chief readily agreed and asked only that he be allowed time to gather this immense treasure from distant parts of his realm. Messengers were dispatched into the surrounding provinces commanding the priests to dismantle the temple treasures and bring them in for the release of their ruler. The holy men obeyed and vast riches were loaded on the backs of beasts of burden and many caravans set out over the tortuous slopes of the Andes toward the redemption of their chief. Although there is nothing in history to indicate that the Indians were not acting in good faith it is recorded that the Spaniards became suspicious at the length of time necessary to cover such long distances with such slow modes of conveyance. In a moment of panic they refuted their promise of safety to the ruler and had him executed, fearing treachery. When news reached the caravans plodding wearily through the mountain fasts the treasures were hastily unloaded and buried there in the mountains, the priests returning quietly to their homes lest the Spaniards overtake them and seize the riches. In the subsequent disintegration of the Inca empire it is thought that most of these riches, being of a sacred nature, were left in their hiding places in the mountains where they remain in the form of quantities of gold and emeralds of unbelievable size to this day. Many expeditions have been fitted out and gone to hunt the lost treasure of the Incas, always hopeful but always unsuccessful. Even now plans are under way by a group of eastern adventurers to invade the snow covered Andes in search of Inca gold and emeralds.

An interesting anecdote is told of the ignorance of the early Spanish soldiers in subjects pertaining to minerology. Some years after monasteries were established in Peru they were invaded by the soldiers and many fine emeralds given to the church by converted Indians were taken. But they were of such fine quality that the Spaniards were in some doubt as to their being genuine. They were told by the monks that real emeralds being almost as hard as the ruby would not break under the blow of a hammer. Some of the stones were tested and immediately shattered. The disgusted Spaniards convinced that the emeralds were false discarded the lot which were retrieved secretly by the crafty fathers.

The now famous source of these emeralds is located near the head waters of the Orinoco in the present Colombian state of South America. The Muzo district is the most productive of several mines all within a radius of a hundred miles or so of one another. The first sight of these mines by white man (the Indians had worked some of the diggings for an unknown period of time) is believed to have been in 1558. Juan Penazon, a Spanish soldier, at the head of a small foraging party, came upon a group of Indians working the stones from the side of a small cliff with the use of wooden crowbars. Another location was discovered prior to this time by another Spaniard, Fernandez de Valenzuela. He is accredited with having

picked up a few stones and returning later. The account concerning him is brief and confusing and might have referred to an occurrence not necessarily in the Muzo district. In 1568 some twelve hundred workmen were mining the Emeralds. The crude methods of the Indians were used. The gem bearing rock being rather soft when first exposed to air was pried out and allowed to roll down hill. Here the rocks were washed somewhat after the placer method of handling gold and the stones recovered by hand. At three month intervals the gems were conveyed on the backs of Indians to the coast where they were shipped to Spain. Some hundred and fifty years later the mines were ordered closed by Charles II since the costs of mining were exceeding the value of production. This is thought to have been due to pilferage, some estimates approximating as high as twenty-five per cent of the output. The mines were soon overgrown with vegetation and to all intent and purposes became lost. About the beginning of the present century one Francisco Restripo, while rummaging among the archives of the Colombian colonial government, came across an old parchment. With the aid of this document he was able to relocate one of the old diggings. Somondoco which is one of the oldest deposits is still unworked.

Muzo, the largest and most important, has been worked intermittently for centuries. It has produced many of the finest stones in history, notably the famous emerald of the Duke of Devonshire and the beautiful stone in the Hope collection. Several contracts to work the mines on both a royalty and a percentage basis have been awarded British companies by the Colombian government which still retains control. These agreements have been in force for periods varying from 5 to 20 years. One such agreement carried a clause restricting the annual output to a value of $1,250,000, with the obvious purpose of regulating the world market. Emeralds here vary from those of microscopic size to crystals as large as or larger than one's thumb. A good stone of five carats is considered rare and is valued at approximately a thousand dollars per carat.

The mines for the most part are characterized by contorted and folded beds of black bituminous limestone containing ammonites of lower cretaceous age. The crystals are obtained from pockets or "nests" in veins of white calcite varying in thickness from two inches to a foot or more. These veins forming a serpent-like latticework through the dark limestone are said to present a striking spectacle wherever they are exposed. This occurrence is unique and many wild speculations have been advanced to explain its origin. Some have suggested that the crystals were washed in from some other source at the time the sedimentary deposits were being laid down. This is merely wild speculation however as the evidence shows conclusively that the crystals were formed **in situ**, probably by heated vapor originating from some nearby cooling igneous rock. The open method of mining is generally employed. The covering soil is removed exposing the gem bearing stratum. In some cases powder is used to break up the rock; at other times the stones are pried out with the use of crowbars and recovered either by hand or with the use of water.

The name emerald is applied only to a particular shade of green of the mineral Beryl which occurs in most of the colors of the rainbow. The pale green variety is the semi-precious aquamarine which unlike the emerald is sometimes found in very large crystals. One such crystal was found in Minas Geraes, Brazil which weighed something over 240 pounds and was transparent from end to end. Rose-red beryls called Morganite, named for the late J. P. Morgan an ardent collector, are mined in Madagascar and California, although the latter source is practically exhausted and the tourmaline mines where it was found closed down. Golden Beryl is found in Ceylon and Brazil. The color of the emerald is believed to arise from small traces of oxide of chromium (which is also accredited with causing the red color of the ruby). For its rarity, transparency and color the emerald retains its place among the most precious of gems. Beryl is a beryllium aluminum silicate expressed in the formula $Be_3Al_2(SiO_3)_6$. Most varieties of beryl other than emerald occur almost exclusively in granite pegmatites. Though Colombia continues to be the principal source of emerald beryls, they are obtained from other and widely distributed localities. In 1830 de-

posits were discovered in the Urals; they are found on the river Takovaya in mica schist associated with aquamarine, alexandrite and phenakite; in Norway in granite; in pale crystals in pegmatite in New South Wales. In the United States several excellent gems have been cut from crystals found in North Carolina at the mines worked for Hiddinite at Stony Point in Alexander county. The tourmaline district of Maine has produced a few gemmy crystals.

It would not be amiss to mention in conclusion a particularly beautiful work of art which found its way into the market early in the present century. It consisted of an emerald of beautiful quality and shade measuring ten by six centimeters and polished only on four sides, the others being left rough. It was mounted on a rock of massive silver around which were grouped six figures of gnomes also of silver with pick axes raised, apparently in an effort to dig out the gem from its naturalistic setting. This piece of art is supposed to have been given by Nicholas I of Russia to Alexander von Humboldt upon whose death it found its way to the auction block. It sold for the astonishingly low price of $505.

Rose Pink Calcite in Texas

By C. L. BROCK

Rose Pink Calcite is found up to this time in only one known locality, this being in Brewster County, in what is known as the Big Bend Country. The exact spot is a secret, known only to the collector, but it is somewhere in the Chisos mountains. The Chisos is an area only about twenty miles long and less than ten miles wide with Mt. Emory the tallest peak reaching a height of 7835 feet. These mountains are fully 80 miles from the nearest railroad station at Alpine or Marathon, Texas.

Chisos in Spanish means ghost and these mountains live fully up to their name as they have for years been the hiding place of bandits, cow thieves, smugglers and renegades. At the same time some of the best Cinnabar or quicksilver deposits in America are located in this district. The Big Bend abounds with traditions and there are found odd rocks and minerals as well as rare plants, fossils, birds and mammals.

Pink Calcite is found on top of the ground and whether it is colored by the violet rays of the sun or by some mineral in the calcite is a question because when broken into it has a beautiful green color in the interior. It is also remarkable in that this variety of calcite is fluorescent under certain types of lights and also phosphorescent under lights such as the Iron-arc and Mercury Vapor light. It has been said by one collector that it glowed long enough from an iron-arc lamp to read a newspaper for 11¾ minutes.

This pink calcite is one of the many new and beautiful minerals that are being brought to light every year.

MINERALOGY QUIZ

(Answers on Page 140)

1. What is the chief ore of lead?
2. For what gem is Maine noted?
3. The finest crystals of stibnite come from where?
4. What beautiful mineral comes from Sicily?
5. What is the common name for fool's gold? For Sulphur diamond? For Arizona Ruby?
6. The finest emeralds come from what country?
7. What county in California is noted for gems?

Lake Street Quarry Near White Plains, N. Y.

By PETER ZODAC, *Editor Rocks and Minerals*

The writer is always interested in visiting mines, quarries, or localities new to him. Therefore, on Thursday, June 14, 1934, when Charles Travis of Peekskill invited him to take a ride to White Plains on business, adding as an inducement that he would be glad to stop at some locality on the way back, the writer accepted the invitation. The locality selected was the Lake Street Quarry.

Lake Street runs east off North Broadway in White Plains (an overhead traffic light is here). One mile on Silver Lake is to the left and at this point a road leads off in the same direction while another goes to the right, but we continued straight on a mile further, or two miles from North Broadway, to the quarry, which is just 100 feet to the left of the road; indeed its office almost borders the road being only 25 feet to its left. The quarry is in two sections, designated by the writer as the west and east quarries and separated only by 25 feet. The west quarry is the larger, being approximately 275 feet long, about 50 feet wide and about 100 feet high. This quarry was the one being worked on our visit.

The east quarry is about 150 feet long, about 25 feet wide and about 75 feet high and was not worked. Both quarries are side hill cuts.

Although called a granite quarry, the rock quarried is a finely banded gray gneiss consisting of albite, biotite, hornblende, microcline and smoky quartz. At least one pegmatite dike is present as pegmatite specimens are common, and it contains the same minerals as does the gneiss; the two most conspicuous minerals being white albite and black biotite.

A young lad who cheerfully acted as guide and whom we believe to be the superintendent's son cautioned us against snakes in the east quarry as they seemed to be plentiful here. The floor of this quarry is inclined to the west at a small angle and is covered with broken up rocks so that the snakes have many good hiding places. To the writer's relief not a single snake was seen.

We were especially interested in finding molybdenite that was reported by Mrs. Garretson[1] as occurring here but to our regret not a specimen was to be found. The Italian superintendent of the quarry assured us that "lead" was quite common and that it was found in the east quarry and by "lead" we assumed it to be molybdenite. Although we were not fortunate in finding even a single specimen of molybdenite, a number of other minerals were collected and with the hope these may prove of some interest, a description of them is here given.

Albite: This is a very common feldspar in the pegmatite. It is white in color, striated, and of good quality. It contrasts pleasingly with the black biotite. Its associated minerals are biotite, pink microcline, and smoky quartz. In the gneiss, the color varies from white to a pale greenish to pinkish, semi-transparent mineral, the latter, if in larger sizes, should take a good polish and make attractive gems.

Albite, var. Peristerite: The most interesting albite, however, is the gray variety which gives off a bluish chatoyancy and is called Peristerite. This is found as small masses in gneiss in the East quarry.

Amphibole var. Hornblende: This is present but not very common. It is one of the constituents of the hornblende-biotite gneiss in which it occurs in small masses but now and then it appears in larger masses than the associated minerals. It reaches its best development in the pegmatite but is not so good as the biotite. Its associated minerals are albite, biotite, microcline and smoky quartz.

Aragonite: A very thin and small grayish-white coating on smoky quartz was noticed and which proved to be aragonite. It was of poor quality and not worth collecting.

Biotite: This mineral is very common and very conspicuous and especially in the pegmatite where its shiny black color stands out sharply against the white albite. It occurs in crumpled,

[1] Garretson, Mary Walleck, M.A., *Molybdenite and Chalcopyrite near White Plains, N. Y.* ROCKS AND MINERALS, Sept., 1931, Vol. 6, No. 3, Whole No. 21, p. 101.

foliated masses over an inch in diameter and of good quality.

Biotite is also one of the constituents of the hornblende-biotite gneiss but occurs as small flakes. Albite, hornblende, microcline and smoky quartz are the associated minerals.

In a few instances, biotite was noticed as minute flakes peppering microcline and smoky quartz that was different from the ordinary occurrence.

Chalcopyrite: This mineral was not found on our visit but was reported by Mrs. Garretson[2] as occurring as films in joints near the contact of granite and gneiss.

Garnet var. Almandite: Small minute grains and crystals in gneiss were noted (and in one specimen in some amount) but they were all of poor grade.

Hematite: This was noticed on one specimen showing a contact of pegmatite with gneiss. The hematite occurred as a red stain on quartz along the contact.

In a cavity in microcline, small deposits of earthy hematite were found. These were adjacent and even surrounded the muscovite crystals present.

Limonite: This is very common as a brown stain on rock. It has been deposited along joint planes and even penetrates minute cracks and crevices. It is especially noticeable on the gneiss. (See also opal).

Sometimes limonite is present as a thin stain on other minerals, especially quartz which appears brownish, but it is chiefly found as a coating of brown and yellow color on the rocks.

In one instance, a minute pyrite cube, partially altered to limonite, was noted in a pinkish gneiss.

Tiny cavities in gneiss filled with brown earthy limonite that marked the location of former minerals which had completly altered to limonite, were also noted. The former minerals might have been pyrite.

Microcline: This is fairly common and occurs in both the gneiss and pegmatite and is conspicuous by its pinkish color. In the pegmatite it is present in large masses up to three inches long; in the gneiss it occurs in small sizes and in both cases it is associated with albite. Biotite, hornblende, and quartz are also present in both rocks.

Molybdenite: This mineral was not found on our visit but was reported by Mrs. Garretson[3] as occurring as films in joints near the contact of granite and gneiss. Molybdenite and chalcopyrite are not found on the same surface but are segregated in joint planes from 1½ to 2 inches apart, she states.

Muscovite: One specimen of a pinkish pegmatite collected contained a small cavity in which were present a number of small, fair crystals of muscovite, surrounded by earthy hematite. This was the only occurrence of muscovite noted.

Opal var. Hyalite: This mineral appears to be rather common and is of secondary origin on weathered gneiss and mica schist. It occurs as thin botryoidal crusts in small patches and these on the edges often assume the form of single strings to a mass of them—and all of grayish-white color. Due to the fact that the gneiss and schist are weathered, these rocks had first been coated with limonite and then the opal had been deposited—oftentimes the opal appears brownish due to the limonite. The hyalite coating on the schist is the thicker of the two but is more stained than that on the gneiss.

Pyrite: Small, minute, brilliant cubes were noted in an altered pinkish gneiss that was collected from near the office. The crystals were of good quality and would make interesting micro-mounts. A small isolated cube on the rear of one of the specimens was partially altered to limonite.

Pyrolusite: Occurs as small, black stains on weathered gneiss.

Quartz var. Smoky: This is the only variety of quartz seen and does not appear to be very common. It occurs in both the pegmatite and gneiss and in both cases it is overshadowed by the other minerals present—at least in the specimens collected. Now and then it does occur in fairly large amounts in the pegmatite. The associated minerals are albite, biotite, hornblende and microcline, in both rocks.

[2] Garretson, Mary Walleck, Work Cited.

[3] Garretson, Mary Walleck. Work Cited.

Collector's Kinks

Collectors are cordially invited to submit notes from their experiences and so make this department of interest to all.

At one time I had collected a quantity of placer gravel which was to be separated into its separate minerals. It was quite fine gravel and due to its method of collection contained along with native gold and other heavy minerals, some white quartz sand. It was too much of a job to separate about twenty pounds of this material by sorting by hand and using a magnifying glass. I therefore worked out the following method, which worked very satisfactorily.

First I constructed a miniature sluice box about 18" long, 2" wide with ⅛" cleats every half inch, gave the box a good coat of shellac, and used a water tap as water supply. After a little experimenting the slope of the box was so adjusted that the water carried away only the lighter of the material such as the quartz sand. After the light material has been all taken out, the remaining gravel was dried. After drying, the magnetite was all removed by means of a small magnet, care being taken to pick up only a little magnetite at a time and shaking the magnet so that other grains would not mass together with the magnetite and be picked up. After the magnetite was all removed, the material remaining consisted of gold, garnet, zircon, silver and some lead minerals (the gravel had been obtained from a dry creek bed). The problem of separating this material was more difficult but it was done.

A piece of plywood about a foot square with a narrow strip of the same material nailed around three sides formed a sort of shallow box. A small quantity of the dried gravel was placed near the open edge. I sat facing this open edge and by blowing gently was able to move the grains of zircon and garnet, leaving the others behind. The sides on the three edges prevent the grains from being blown off the board. The remaining grains were then easily separated by hand.

C. W. REITSCH,
Denver, Colo.

Mineral Oddities

Pumice is a rock and so light as to float on water.

Lodestone is a variety of magnetite (an iron ore) with so strong a polarity as to pick up small nails, tacks, etc. It is thus a natural magnet. Extra strong lodestones will pick up large nails; weak lodestones may not even move small tacks. Lodestone is always black.

Aquacreptite is an earthy, brown mineral and takes its name from the loud crackling sound given off when immersed in water.

Iceland spar is a very clear, transparent variety of calcite. If such a specimen be placed over a written word, line, or any small figure, the image seen through the spar is doubled. It received its name from Iceland where it was first found.

A number of minerals when scratched in the dark (by a nail or knife) give off sparks. Among them are some varieties of sphalerite, tremolite, wollastonite, willemite, etc. Minerals of this nature are known as triboluminescent minerals.

Many minerals phosphoresce in the dark. To observe this phenomenon, hold a mineral up against a bright electric light for about a minute, keeping your eyes tightly closed while so doing, then turn off the light, bring the mineral down quickly so as to be level with your eyes and look at it. If it is phosphorescent it will glow with a pale white light, though perhaps for only a second. Selenite, calcite, and precious opal are some minerals that are often phosphorescent.

The Amateur Lapidary

Conducted by J. H. HOWARD*

504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones.* A practical guide-book written in non-technical language for those who desire to cut and polish semi-precious stones.

LAPIDARY RESEARCH

By ARTHUR KNAPP

In the beginning, the amateur lapidary should be satisfied to follow explicitly any directions he can obtain, on how to cut or polish either cabochons, slabs or faceted gems. After he is thoroughly grounded in any process, he should no longer be satisfied to stick in a rut, unless he is simply out to produce a large number of specimens.

As far as the writer has been able to find out, no research work has been done on the subject of gem cutting and polishing. A little work has been done on the optics of gems but none on the mechanical side. Interviews with professional lapidaries discloses that the trade knows how to perform certain routine operations in order to obtain certain results. Many of these operations are uncertain in their results and are not satisfactory. These operations appear to be the result of the cut and try method of many years ago and have not been improved upon greatly in recent years. It is certain that there are no writings in the English language in recent years which indicate that any research is being undertaken to improve processes or appliances.

This means that the entire field of the lapidary is open to investigation and that the amateur is just as well qualified as the professional to make improvements in technique. Many of our amateurs are professional men in other lines, trained to make laboratory observations and having a general knowledge of physics, chemistry or mechanics to draw upon.

Therefore the writer suggests, first, that the amateur try new methods or appliances which may occur to him and second, that he pass on to other amateurs what he has done and what his results have been. Every lapidary had gems that he could do nothing with; however, when worked on later, these same gems have been polished without trouble. The question then arises as to what conditions governed on the second trial which were absent on the first trial? By the exchange of experiences and information it is possible that polishing may be brought to a more exact science than it is at present.

In order to give some concrete examples of what the writer has in mind, there is given below a list of the different laps which the writer has on his shelves, together with remarks about their use. It may be that the reader will get some new ideas from this list.

Cast Iron—If you have these cast specially for you, have the side which is down in the mold dressed for the working side. Have it thoroughly annealed, if possible.

Tin—The writer uses an aluminum face plate with a one-eighth inch disc of tin. This is much easier on bearings than a thick lap and the same investment allows of a stock of many more laps, for various uses.

Babbet Metal—There is no difference, as far as the writer can observe, in the action of a lap of the best grade of babbet metal over that of tin, when polishing facets. It appears to stand up better for polishing large flats,

as it is slightly harder than tin.

Copper—Useful for polishing gems harder than quartz.

Masonite flooring—This material is very hard and without grain. The writer has polished facets on it, although it is slower than tin. In general its action is the same as tin except slower. It is very useful on soft materials.

Linotile—A hard linoleum which will stand up under very heavy pressure and useful for polishing slabs when heavy pressure is desired.

Battleship Linoleum—This may be used in place of wood for working cabochons with 150 or FF carborundum. Does not develop bumps. As it is inexpensive, a number with different sizes and shapes of grooves may be carried in stock by the amateur. Useful for polishing soft flats.

Maplewood—Useful for a rough polish on flats using the periphery.

Wool-carpet—A piece of good wool-carpet makes an excellent polishing lap where heavy pressure is desired. It is useful both on soft gems such as opal and on quartz, particularly tiger eye.

Leather—A leather drum is particularly useful for polishing soft cabochons, as its yielding surface prevents the formation of flats. Buckskin makes the best lap but medium hard leather works almost as well when thoroughly wet.

Felt—Since these are expensive the writer never uses them when carpet or linoleum will do.

Recent "Finds" of Interest

Rocks and Minerals would be pleased to have its readers submit short notes on their "finds" to this department.

A beautiful variety of opal has recently been found on Hardtrigger Creek, Owyhee County, Idaho by Wilbur Shuee of Caldwell, Idaho. A specimen was donated to the U. S. National Museum and in acknowledging its receipt they said:

"The specimen is an interesting one in a devitrefied perlite. It is different from the other opals in our collection and is of interest because of the geological occurrence and also the number of contrasting colors of opal shown."

Phosphorescent selenite crystals have been found in the abandoned clay pits of Hudson, N. Y. by Carl Klein of that city.

Fluorescent calcite that is also phosphorescent has recently been found in Pittsburgh, Penn., by George C. Connors of that city.

Another fluorescent and phosphorescent calcite of a rose-pink color has been brought to light through the efforts of C. L. Brock of Houston, Texas. The exact locality is not known as the finder will not divulge the information; it is somewhere in the Chisos mountains of Brewster County, Texas.

Interesting and beautiful obsidians, many of which are iridescent, have recently been found at Stauffer, Oregon, by P. L. Forbes of that city. An article on their occurrence appeared in the last issue of ROCKS and MINERALS.

Leucoxene, an alteration product of titanite, has been found by Peter Zodac of Peekskill, N. Y. The locality is 3 miles north of Peekskill along the Albany Post Road. Boulders in a stone wall contain small crystals of titanite and these have altered to leucoxene.

MINERALOGY QUIZ—Answers

(Questions on Page 135)

1. Galena.
2. Tourmaline
3. Japan
4. Sulphur
5. Pyrite. Pyrite. Garnet, var. Pyrope.
6. Colombia.
7. San Diego County.